New records of the Julia Creek Dunnart *Sminthopsis douglasi* in central-north Queensland

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Introduction

The Julia Creek Dunnart *Sminthopsis douglasi* has had a reputation as one of the more cryptic and restricted of Australia's dasyurid marsupials, despite being also the largest member of its genus (Woolley 1995). Only four museum specimens existed prior to 1992, all derived from a small area of "Downs Country" between Richmond and Julia Creek (Woolley 1995). Woolley (1992) reported further *S. douglasi* localities and these extended the range beyond the previously identified maximum geographic distribution. She concluded that the range of the species was certainly much larger than identified, and that the small number of known specimens was a result of low sampling effort rather than a pattern of natural restriction.

Sminthopsis douglasi is considered to be obligate in habitat to treeless or lightly timbered tussock grasslands on cracking clay soils associated with the Mitchell Grass Downs and parts of the Gulf Plains Bioregions in northern and western Queensland. Given that this vegetation within Queensland covers over 20 million hectares (Sattler and Williams 1999), one might safely expect a species with such a strong environmental association to be more widespread within regions of potential habitat, even if there was some degree of climatic restriction. Apart from habitat preference, the extant distribution and abundance of this species is thought to be primarily influenced by predation by feral cats and foxes, loss of adequate grass cover and disturbance to soil structure by hoofed stock (Maxwell *et al.* 1996). This note reports new locality data for *S. douglasi* collected during a large-scale inventory vertebrate fauna survey in the Desert Uplands Bioregion. Habitat data, distribution and possible implications for conservation status are discussed.

Study area and methods

A fauna survey of the Desert Uplands Bioregion (Fig. 1) was undertaken between 1997 and 2000, in order to assess the variation in vertebrate species abundance and distribution across a range of regional ecosystem types (*sensu* Sattler and Williams 1999). The Desert Uplands is situated within Australia's northern tropical savannas and straddles the Great Dividing Range between Charters Towers, Hughenden and Blackall, sharing a boundary with the Mitchell Grass Downs to the west (Fig. 1). The climate is semi-arid, dominated by sandstone ranges and sand plains with soils of mostly poor structure and fertility and comprising of open *Acacia* and *Eucalypt* woodlands, ephemeral lake and dune systems and hummock and tussock grasslands (Sattler and Williams 1999). The neighbouring Mitchell Grass Downs covers a vast geographic area in both Queensland and the Northern Territory and, as the name suggests, is predominated by *Astrebla* spp grasslands on rolling plains of deep, heavy cracking clays (Sattler and Williams 1999). The vertebrate fauna of this bioregion has been recently studied in detail, indicating climatic, location and substrate gradients control patterns of vertebrate species assemblage (Fisher 2001).

The survey of the Desert Uplands primarily utilised a standardised quadrat array (1 ha) for sampling, a technique modified from Woinarski and Fisher (1995). Sampling incorporated a trapping grid (four pitfall and twenty small Elliott traps in a 50x50 m square) and timed observations (four morning bird counts, two diurnal and two nocturnal searches) all undertaken over a 96 hour period. Traps were baited with peanut butter, rolled oats and honey, with cat biscuits added to each alternate trap. A total of 196 sites were sampled, with 140 of these being sampled in two seasons. As an adjunct to the trapping, cat and fox gut contents were collected across the Desert Uplands and adjacent areas of the Mitchell Grass Downs, by local professional kangaroo and pig shooters. Date, locality and morphometric data for the predator collected were recorded by the shooters, and gut samples were stored in 70% ethanol. Contents were subsequently washed with whole prey and pieces sorted into the lowest taxonomic groups possible. All contents, except invertebrates and hair, were sent to the Queensland Museum for identification. Stomachs containing only hair (i.e. no identifiable mammal body parts) were sent to Barbara Triggs (c/- "Dead Finish", Genoa, Victoria) for identification. A total of 185 cat and nine fox guts were collected over a two year period, representing a minimum of 1300 prey items.

New records of Sminthopsis douglasi

From the combined trapping survey and predator gut collection, a total of six localities, representing 14 individual *Sminthopsis douglasi* were obtained (Fig. 1, Table 1). Two of these localities were within the Desert Uplands Bioregion (Moorrinya National Park, Ashton Station), and these represent six live-trapped animals. A further four localities were obtained from the predator gut contents (six whole

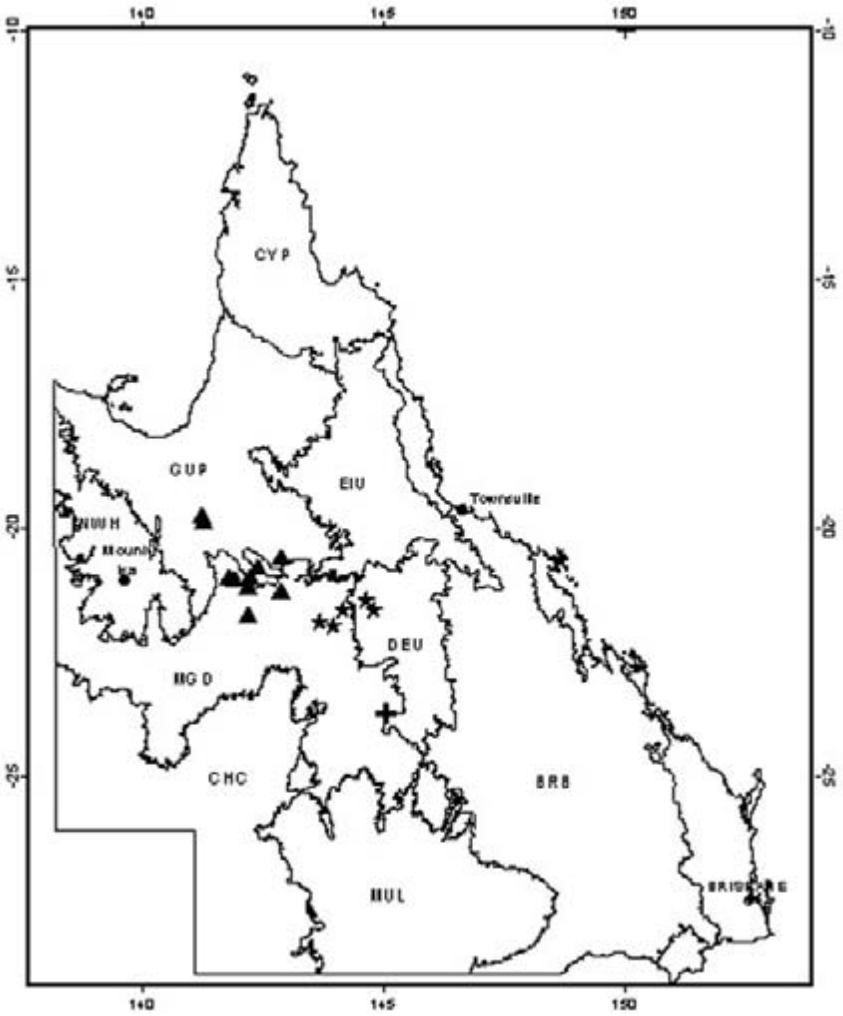

Figure 1. Locality data for the Julia Creek Dunnart *Sminthopsis douglasi* in Queensland. Solid circles indicate records from Woolley (1992) and the Queensland Museum. Solid stars represent confident localities reported in this study. Solid cross represents southern hair-only record from Dunblane. Bioregion abbreviations: MGD = Mitchell Grass Downs, DEU = Desert Uplands, GUP = Gulf Plains, CHC = Channel Country, MUL = Mulga Lands, NWH = North-west Highlands, EIU = Einasleigh Uplands.

animals, two hair sample identifications), all of which derived from the adjacent Mitchell Grass Downs to the west (Katandra, Cameron Downs, Waverley, Dunblane Stations). The records at Moorrinya National Park represent the most eastern records of the species, some 200 km from previously published localities (Woolley 1992), while the record at Dunblane, near Barcaldine, is a further 200 km south from Moorrinya and an unexpected 300 km south-east from the *S. douglasi* records in Woolley (1992).

The *S. douglasi* from Ashton and Moorrinya were trapped in September and October 2000 respectively. All were adult males ranging in size from 48 to 55 g, and were captured in the Elliott traps. Accurate head-body and tail measurements were not recorded. Two other mammals were recorded sympatrically: *Planigale ingrami* at Ashton and *Rattus villosissimus* at Moorrinya. The Ashton site was sampled previously in August 1999 and the Moorrinya sites in July 2000, and in both cases no *S. douglasi* were captured for the same sample effort (80 trap-nights per site). Though little detail has been published previously, the habitat description for each of the trap sites seems typical of that reported (Woolley 1992; Maxwell *et al.* 1996): at Ashton Station, tussock grasslands (40% cover and 0.4m height), on deep cracking clays comprising of predominantly *Dichanthium sericeum*, *D. fecundum*, *Eulalia aurea*, *Eragrostis xerophila* and *Enneapogon polyphyllus*, with occasional low shrubs of *Acacia farnesiana* and *A. suthrelandii*; and at Moorrinya, tussock grasslands (40-65% cover and 0.4-0.5m height), on deep cracking clays comprising of *Astrebla lappacea*, *A. squarrosa, Eulalia aurea*, *Eriochloa crebra*, *Iseilema vaginiflorum*, *Aristida latifolia*, *Panicum decompositum*, *Dichanthium sericeum*, *Eragrostis xerophila* and *Sporobolus actinocladus*. It is notable that very short annual surveys at Moorrinya National Park since its gazettal in 1996 by a James Cook University wildlife course did not record *S. douglasi* until after five years of survey (S. E. Williams, pers. comm. 2000, James Cook University). However since no vegetation sampling or parallel surveys of adjacent actively grazed properties were undertaken, a relationship between the removal of grazing and the reappearance of *S. douglasi* can only be anecdotally inferred.

Table 1 Locality data, date and source of recent *Sminthopsis douglasi* records.

Location	Date collected	Number of *S. douglasi* in gut sample or quadrat	Latitude	Longitude	Source	Queensland Museum no.
Dunblane Station	01/10/1997	1	23°32.4'	145°11.76'	Cat	Hair sample
Cameron Downs	28/11/1997	1	21°22.8'	144°15.6'	Cat	Hair sample
Katandra Station	03/06/1998	1	21°36'	143°45'	Cat	JM13823
Katandra Station	03/06/1998	1	21°36'	143°45'	Fox	JM13811
Waverley Station	27/06/1998	1	21°40.8'	144°02.4'	Cat	JM13710
Waverley Station	12/06/1998	3	21°40.8'	144°02.4'	Cat	JM13712-14
Ashton Station	22-25/09/2000	2	21°09.86'	144°44.99'	Elliott trap	Released
Moorrinya NP	24-27/10/2000	1	21°22.56'	144°55.85'	Elliott trap	Released
Moorrinya NP	24-27/10/2000	3	21°22.35'	144°56.26'	Elliott trap	Released

Six whole *Sminthopsis douglasi* was found as a prey item in three cat and one fox gut (Table 1). Three gut samples contained a single specimen, and one (feral cat) contained three animals. Within the fox, *S. douglasi* constituted the sole prey item, while in the cat, the number of other individual prey items ranged from 3 to 14 and included birds, reptiles and invertebrates (author unpubl. data). *Sminthopsis douglasi* was the sole mammalian prey item in two of the cats, though these samples contained large numbers of reptiles (author unpubl. data). *Sminthopsis douglasi* was found in 6% of the Mitchell Grass Downs bioregion cat samples, and overall 62% of these contained mammalian prey items (author unpubl. data). Because it is impossible to identify the exact location where the *S. douglasi* prey items were taken, detailed description of the habitat of these specimens is not provided except to say that the properties they were collected from are dominated by *Astrebla* spp. tussock grasslands on cracking clay soils.

Two localities for *S. douglasi* from gut content data were identified via hair samples in only: Cameron Downs and the south-eastern locality at Dunblane. The former lies adjacent Katandra and Waverley Stations where whole animals were found, and despite any contention of the veracity of hair identifications, it is considered an acceptable locality based on known distribution and habitat. However the Dunblane record represents a substantial southern range expansion and therefore must be treated with more caution. Hair samples of *S. douglasi* are considered morphologically distinct and readily identified from other *Sminthopsis* species (B. Triggs pers. comm., 2000 "Dead Finish", Genoa, Victoria). Conversely, the value of hair identifications has been questioned and tested (Lobert *et al.* 2001), and these authors have concluded that *Sminthopsis* identification using hair samples is unreliable (i.e. taxa correctly identified in <83% of cases), at least in south-eastern Australia. Though the identification of *S. douglasi* at Dunblane was considered "definite" in comparison to examples in a voucher library (B. Triggs, pers. comm. *ibid.*), the verisimilitude of hair samples in comparison to whole animals is recognised. As such, an intact specimen would be required to confirm this predicted significant southern range extension.

Discussion

Since its discovery in 1931 (Archer 1979), *Sminthopsis douglasi* has been an elusive species, and these records from more widespread localities are heartening. Correspondingly, data regarding its habitat, distribution and breeding biology have accumulated slowly (Woolley 1992; Woolley 1995; Hume *et al.* 2000), likely due to the species low abundance, patchy occurrence, prevailing potential habitat, and relatively limited comprehensive survey effort within its range. The value of large systematic base-line fauna surveys has been proven by the recent identification of declines in small mammal populations in parts of Kakadu National Park (Woinarski *et al.* 2001).

These records have provided an opportunity to expand information on *S. douglasi* distribution, and have indicated an increased range within the Mitchell Grass Downs and an adjacent bioregion (Desert Uplands) that has appropriate habitat. The Dunblane record, though requiring verification by a live specimen, hints at an extended southern range for the species into a marginally more variable climatic zone (Fisher 2001). However this record lies within the same Mitchell Grass Downs sub-region (Central Downs, Sattler and Williams 1999) as the Cameron Downs, Katandra and Waverley specimens. This sub-region shares a distinct, common landscape pattern based on geomorphological, soil, geological, climate and vegetation characteristics (Sattler and Williams 1999). As such the presence of *S. douglasi* throughout the extent of this sub-region may not be an unreasonable prediction.

The outlying records in the western sub-region (Prairie-Torrens Creek) of the Desert Uplands are also notable in that the bioregion consists of predominantly sandstone communities at slightly higher altitude to the core Mitchell Grass Downs to the west. The tussock grasslands in the Desert Uplands are partially disjunct and isolated by a large intervening Tertiary sandstone surface, though are physiologically and geographically linked from the north and south to the typical grasslands of the adjacent Mitchell Grass Downs Bioregion (Sattler and Williams 1999). The presence of *S. douglasi* in this area (likely the very eastern edge of its distribution), and the possible southern record from Dunblane, tends to suggest that, at least historically, the species may have been more prevalent. Current patterns of rarity may be an artefact of more recent impacts of feral predators, pastoralism and

changes in land management, combined with naturally low abundances. Intangible distribution and abundance is a common feature of other declining small Australian mammals (Short and Smith 1994; Woinarski *et al.* 2001).

Curiously, intensive surveys in continuous Mitchell Grass Downs areas to the west in the Northern Territory (Barkly Tableland, Georgina Limestone sub-regions), have failed to record any *S. douglasi* (Fisher 2001). The landscapes in these areas support a more diverse vegetation and soil mosaic in comparison to those where existing *S. douglasi* records are derived (Sattler and Williams 1999). The Northern Territory tussock grasslands have been assessed as having a distinctive faunal character, predicted by broad climate and substrate gradients (Fisher 2001). The low number of records and current survey data preclude any elucidation of the environmental determinants of *S. douglasi* distribution, except to speculate that perhaps higher rainfall, limestone geology and swampy nature of the clay plains in the Barkly Tableland and Georgina Limestone areas (Sattler and Williams 1999) may effect soil structure and cracking behaviour, an obvious micro-habitat feature associated with *S. douglasi* presence. Without more intensive sampling for *S. douglasi*, its presence near Queensland-Northern Territory border and perhaps within the Northern Territory itself cannot be fully discounted.

The identification of an expanded distribution for an endangered species (Queensland Government 1997) is welcome, but does not exclude *S. douglasi* from this high rating, given the total number of records is still very low. An indicative distribution identified by a series of point localities provides an adequate snapshot of range limits, but cannot in any way act as a surrogate for an understanding of the fine-scale spatial and temporal patterns of occurrence. The presence of a number of specimens in cat and fox gut samples reinforces the suggestion that feral predators are a genuine threat to this small mammal. The trapping of specimens in both ungrazed (Moorrinya National Park) and actively grazed habitats (all other localities) suggest this species can persist in sites with hoofed stock, though under such regimes the species may be in a state of decline or more susceptible to feral carnivore predation, an antecedent common to many other mammal declines (Short and Smith 1994). This suggests that *S. douglasi* populations still cannot be considered secure until their biology and distribution is more firmly understood.

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Since the completion of this manuscript, the *Julia Creek dunnart Recovery Plan* has been released (Lundie-Jenkins *et al.* 2002). In this document, a footnote reports the discovery of a population of *S. douglasi* of indeterminate population size at Bladensberg National Park (22°30'S, 143°E). This location is much closer to Dunblane (23°32'S, 145°11'E) in comparison to existing whole-animal records (e.g. Waverley 21°40'S, 144°E) and also lies within the southwestern portion of the Central Downs province of the Mitchell Grass Downs. Though the inconclusiveness of the southern hair record reported in this paper still stands, the Bladensberg record is further support for the contention of a wider, more southern distribution of *S. douglasi* than previously considered.

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